



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

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Weather Study

METEOROLOGY

CEN18FA054

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A. ACCIDENT

Location: Reeds Springs, Missouri
Date: December 17, 2017
Time: about 1830 central standard time
0030 universal coordinated time (UTC) on December 18, 2017
Airplane: Piper PA-28-180; registration: N6433J

B. METEOROLOGIST

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C. SUMMARY

On December 17, 2017, about 1830 central standard time, a Piper PA-28-180 airplane, N6433J, impacted terrain near Reeds Spring, Missouri. The pilot and passenger were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by a private individual, as a 14 *Code of Federal Regulations* Part 91 personal flight. Instrument meteorological conditions existed near the accident site about the time of the accident, and no flight plan had been filed. The cross-country flight departed the Gardner Municipal Airport (K34), Gardner, Kansas, about 1700, and was en route to the M. Graham Clark Downtown Airport (KPLK), Branson, Missouri.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). All times are central standard time (CST) based upon the 24-hour clock, local time is +6 hours to UTC, and UTC=Z. NWS airport and station identifiers use the standard International Civil Aviation Organization (ICAO) 4-letter station identifiers versus the International Air Transport Association (IATA) 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 36.724722° North and longitude 93.396111° West, at an elevation of approximately 1,368 ft.

E. WEATHER INFORMATION

1.0 Synoptic Conditions

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction (NCEP) located in College Park, Maryland. These are the base products used in describing weather features and in the creation of forecasts and warnings. Reference to these charts can be found in the joint NWS and Federal Aviation Administration (FAA) Advisory Circular “Aviation Weather Services”, AC 00-45H.

1.1 Surface Analysis Chart

The central section of the NWS Surface Analysis Chart for 1800 CST (0000Z on December 18, 2017) with the accident site marked by a red star is included as figure 1.

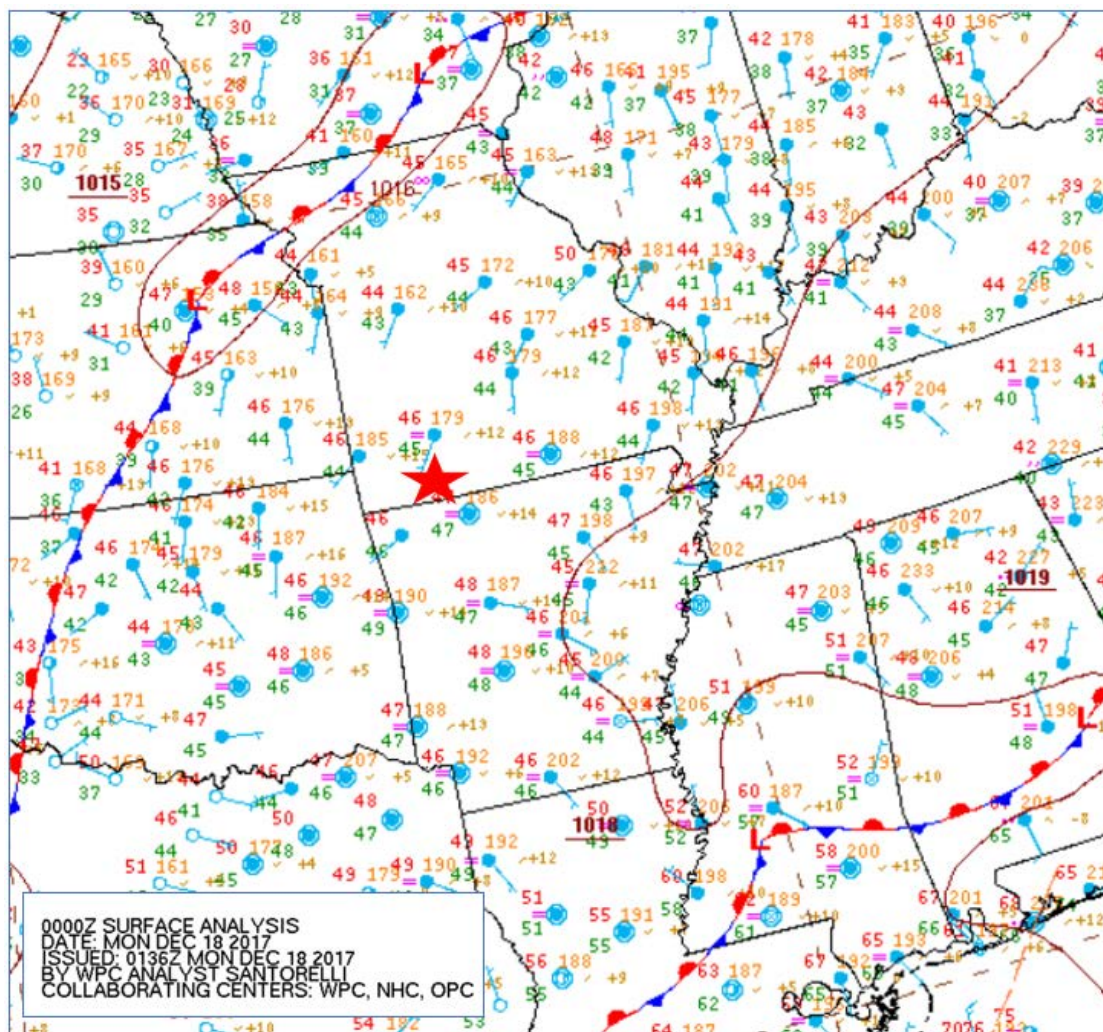


Figure 1 – Central section of the NWS Surface Analysis Chart for 1800 CST

The Surface Analysis Chart depicted a low-pressure system at 1015-hectopascals (hPa) over eastern Kansas immediately west of the departure station near Kansas City to the north-northwest of the accident site along a stationary front that extended across Iowa, northwest Missouri, eastern Kansas into Oklahoma, and Texas. To the south of the accident site, another stationary front extended across Louisiana, Mississippi where another low-pressure system at 1018-hPa was located with the front continuing eastward across Alabama and into Georgia. The accident site was located between these two stationary fronts in a neutral area in pressure or a col, and where a weak pressure gradient existed. The station models immediately surrounding the accident site depicted calm to light winds of 5 knots or less, overcast sky cover, with visibility restricted in fog or mist, with temperatures of 46° to 47° Fahrenheit (F), with temperature-dew point spreads of 1° F or less.

1.2 National Composite Reflectivity

A review of the NWS National Composite Reflectivity image from 1800 through 1900 CST depicted no significant weather echoes associated with precipitation over the area to impact the flight. As a result, the radar image was not shown.

1.3 Weather Depiction Chart

The central section of the NWS Weather Depiction Chart issued by NCEP for 1600 (2200Z) and 1900 CST (0100Z on December 18, 2017) depicting the frontal systems and the observed general flight categories¹ at the time are included as figures 2 and 3 respectively with the accident site within the red circle. The chart depicted Instrument Flight Rule (IFR) conditions by a shaded contour, Marginal Visual Flight Rule (MVFR) conditions with an unshaded contour, and outside of the contours Visual Flight Rule (VFR) conditions.

¹ As defined by the NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) – ceiling below 500 ft agl and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) – ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) – ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles while MVFR is a sub-category of VFR.

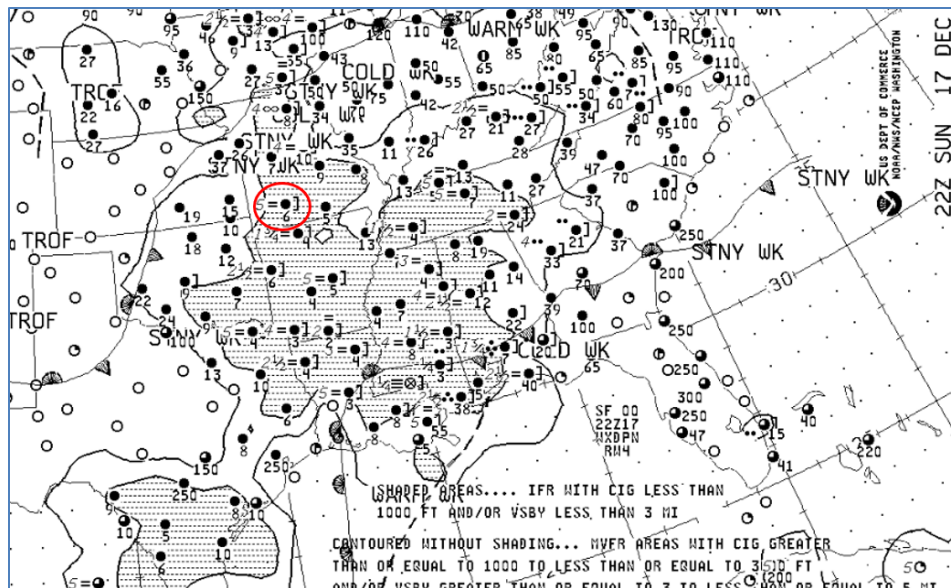


Figure 2 - Weather Depiction Chart for 1600 CST

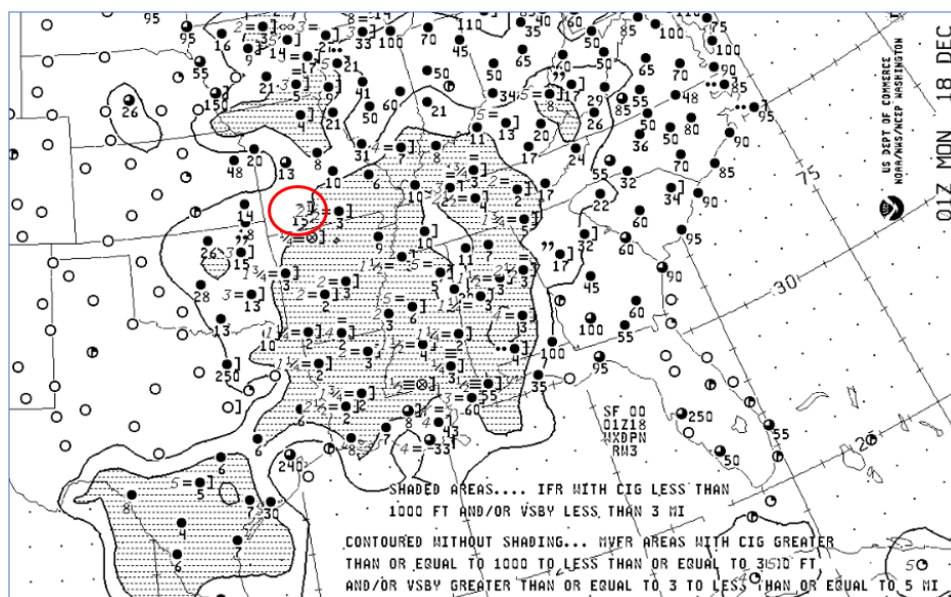


Figure 3 - Weather Depiction Chart for 1900 CST

The Weather Depiction Charts depicted an extensive area of IFR conditions extending over southern Missouri southward to eastern Texas and Louisiana. The station model in the vicinity of the accident site depicted on the 1600 CST chart a ceiling overcast at 500 ft agl, with visibility 5 miles in mist. No station models were depicted on the 1900 CST due to unknown reasons and did not fully depict the extent of the IFR conditions at the time.

1.4 12-hour Low-Level Significant Weather Prognostic Chart

The 12- and 24-hour Low-Level Significant Weather Prognostic Chart that was valid prior to the flights departure was documented and is included as figure 4. The image on the left was the 12-hour forecast valid for 1800 CST and the image on the right the 24-hour forecast valid for 0600

CST on December 18, 2017. The charts depicted the general flight categories expected during the period by colored lines; where a red solid line represented IFR conditions, a blue scalloped line MVFR conditions, and outside of the contours VFR conditions. In addition, the chart provided where low-level turbulence conditions were expected by a brown dashed line, and the location of the freezing level by a light blue dashed line.

The 12-hour forecast chart on the left in figure 4 depicted an area of IFR conditions over southern Missouri, Arkansas, Louisiana, Mississippi, Alabama, and Tennessee, with another small area over central Missouri. The area was surrounded by a larger area of MVFR conditions which extended over the central portion of the country and included eastern Kansas. No significant areas of turbulence were noted over Missouri and the freezing level was depicted from 12,000 ft over southern Missouri sloping to 4,000 ft over northern Missouri.

The 24-hour forecast chart on the right side of figure 4, depicted the area of IFR conditions expanding over the entire central portion of the country and extending over all of Missouri. The freezing level lowered from 8,000 ft over southern Missouri to the surface over northern Missouri.

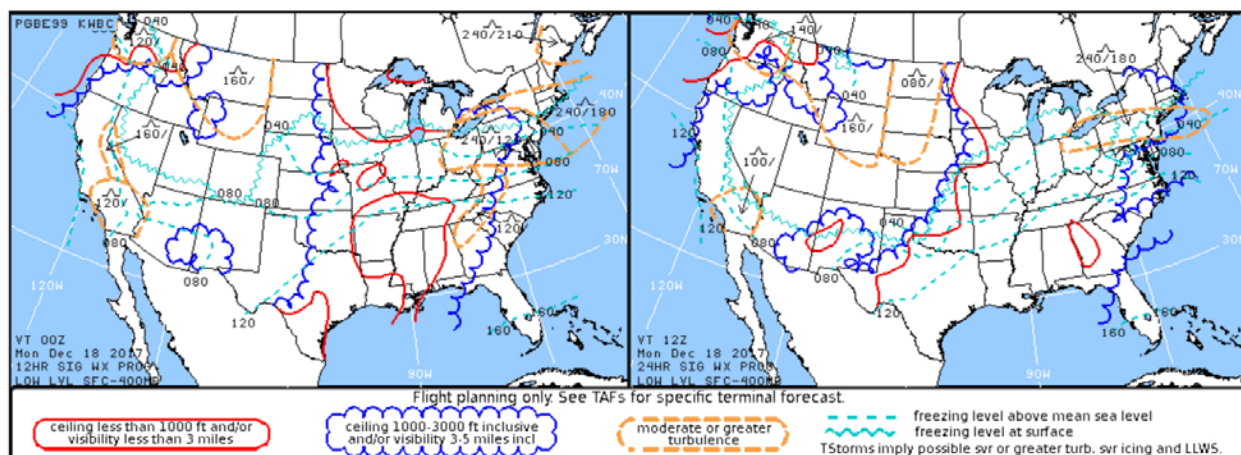


Figure 4 - 12/24-hour Low-Level Significant Weather Prognostic Chart valid at the time of departure

2.0 Observations

The surrounding area was documented using official Meteorological Aerodrome Reports (METARs) and special reports. Cloud heights are reported in height above ground level in the following section.

2.1 M. Graham Clark Downtown Airport, Branson

The planned destination was M. Graham Clark Downtown Airport (KPLK), Branson, Missouri located 10 miles southwest of the accident site at an elevation of 940 ft. The airport did not have weather reporting capability, although instrument approach procedures are available into the airport (RNAV (GPS) approaches to runway 12 and 30).

2.2 Branson West Municipal Airport – Emerson Filed, Branson West

The closest weather reporting location to the accident site was from Branson West Municipal Airport – Emerson Field (KFWB), Branson West, Missouri located about 1 mile south of the accident site at an elevation of 1,348 ft. The airport listed a magnetic variation of 2° East and had an Automated Weather Observation System (AWOS) installed and issued observations every 20-minutes. The KFWB AWOS was reporting the following conditions around the time of the accident:

KFWB weather observation at 1815 CST, automated, wind calm, visibility less than 1/4 mile in fog, ceiling overcast 400 ft, temperature 8° Celsius (C), dew point 8° C, altimeter 30.08 inches of mercury (Hg). Remarks; automated observation system with a precipitation discriminator.

KFWB weather observation at 1835 CST, automated, wind calm, visibility 1/2 mile in fog, ceiling overcast at 400 ft, temperature 8° C, dew point 8° C, altimeter 30.08 inches of Hg. Remarks; automated observation system with a precipitation discriminator.

The raw observations in standard METAR format and time in UTC with the general flight categories from approximately 1500 through 2030 CST are included below:

IFR METAR KFWB 172055Z AUTO 23004KT 2SM BR OVC006 08/08 A3003 RMK AO2=

IFR METAR KFWB 172115Z AUTO 24003KT 1 3/4SM BR OVC005 08/08 A3003 RMK AO2=

LIFR METAR KFWB 172135Z AUTO 00000KT 3/4SM BR OVC004 08/08 A3004 RMK AO2=

LIFR METAR KFWB 172155Z AUTO 00000KT 3/4SM BR OVC003 08/08 A3004 RMK AO2=

LIFR METAR KFWB 172215Z AUTO 00000KT 1/2SM FG OVC003 08/08 A3005 RMK AO2=

LIFR METAR KFWB 172235Z AUTO 00000KT 1/2SM FG OVC003 08/08 A3005 RMK AO2=

LIFR METAR KFWB 172255Z AUTO 00000KT 1/2SM FG OVC004 08/08 A3006 RMK AO2=

LIFR METAR KFWB 172315Z AUTO 00000KT M1/4SM FG OVC004 08/08 A3006 RMK AO2=

LIFR METAR KFWB 172335Z AUTO 00000KT 1/2SM FG OVC002 08/08 A3007 RMK AO2=

LIFR METAR KFWB 172355Z AUTO 00000KT 1 1/4SM BR OVC003 08/08 A3007 RMK AO2=

LIFR METAR KFWB 180015Z AUTO 00000KT M1/4SM FG OVC004 08/08 A3008 RMK AO2=

Accident 0030Z

LIFR METAR KFWB 180035Z AUTO 00000KT 1/2SM FG OVC004 08/08 A3008 RMK AO2=

LIFR METAR KFWB 180055Z AUTO 00000KT 1/4SM FG OVC003 08/08 A3008 RMK AO2=

LIFR METAR KFWB 180115Z AUTO 00000KT 1 1/4SM BR OVC003 08/08 A3008 RMK AO2=

LIFR METAR KFWB 180135Z AUTO 00000KT 3/4SM BR OVC002 08/08 A3008 RMK AO2=

LIFR METAR KFWB 180155Z AUTO 00000KT M1/4SM FG OVC002 08/08 A3008 RMK AO2=

LIFR METAR KFWB 180215Z AUTO 00000KT M1/4SM FG OVC002 08/08 A3008 RMK AO2=

2.3 Branson Airport, Branson

Branson Airport (KBBG), Branson, Missouri was located about 14 miles southeast of the accident site at an elevation of 1,302 ft. The airport had an AWOS and issued reports hourly. The following conditions were reported surrounding the period:

KBBG weather observation at 1745 CST, wind calm, visibility 1 mile in mist, ceiling overcast at 200 ft, temperature 7° C, dew point 7° C, altimeter 30.07 inches of Hg.

KBBG weather observation at 1845 CST, wind calm, visibility 1 3/4 miles in mist, ceiling overcast at 200 ft, temperature 7° C, dew point 7° C, altimeter 30.08 inches of Hg.

The raw METARs and general flight categories surrounding the period were as follows:

LIFR METAR KBBG 172145Z 00000KT 3/4SM BR OVC003 07/07 A3004=

LIFR METAR KBBG 172245Z 00000KT 3/4SM BR OVC002 07/07 A3005=

LIFR METAR KBBG 172345Z 00000KT 1SM BR OVC002 07/07 A3007=

Accident 0030Z

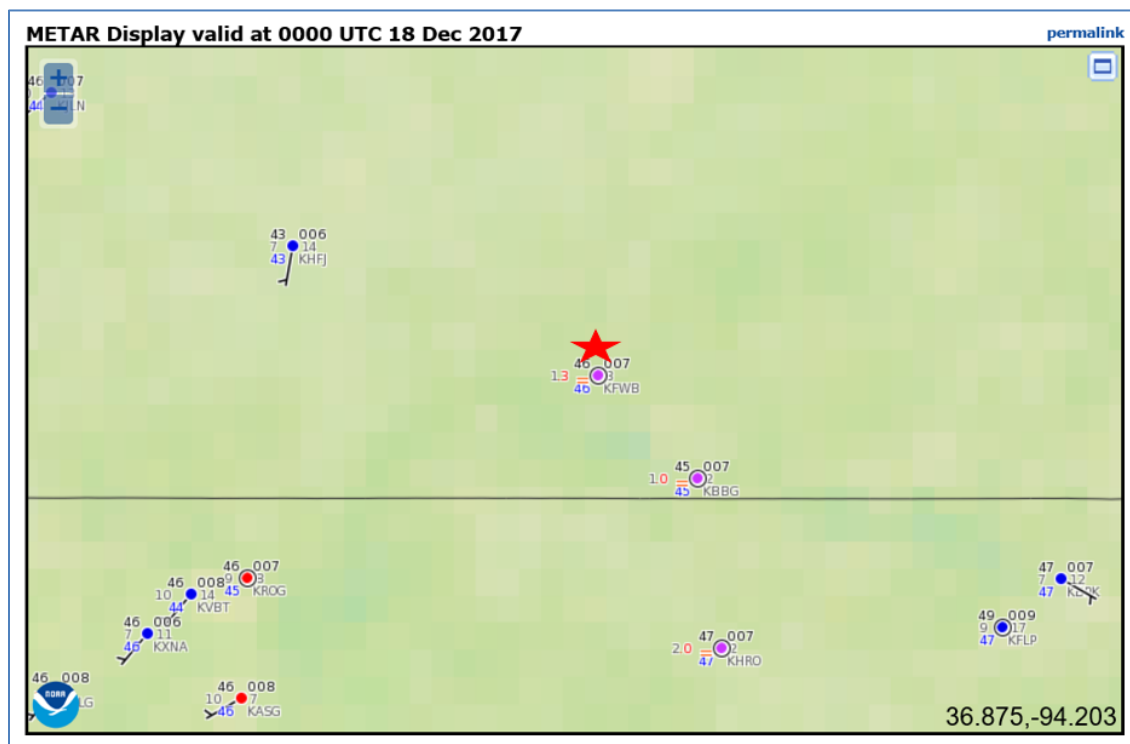
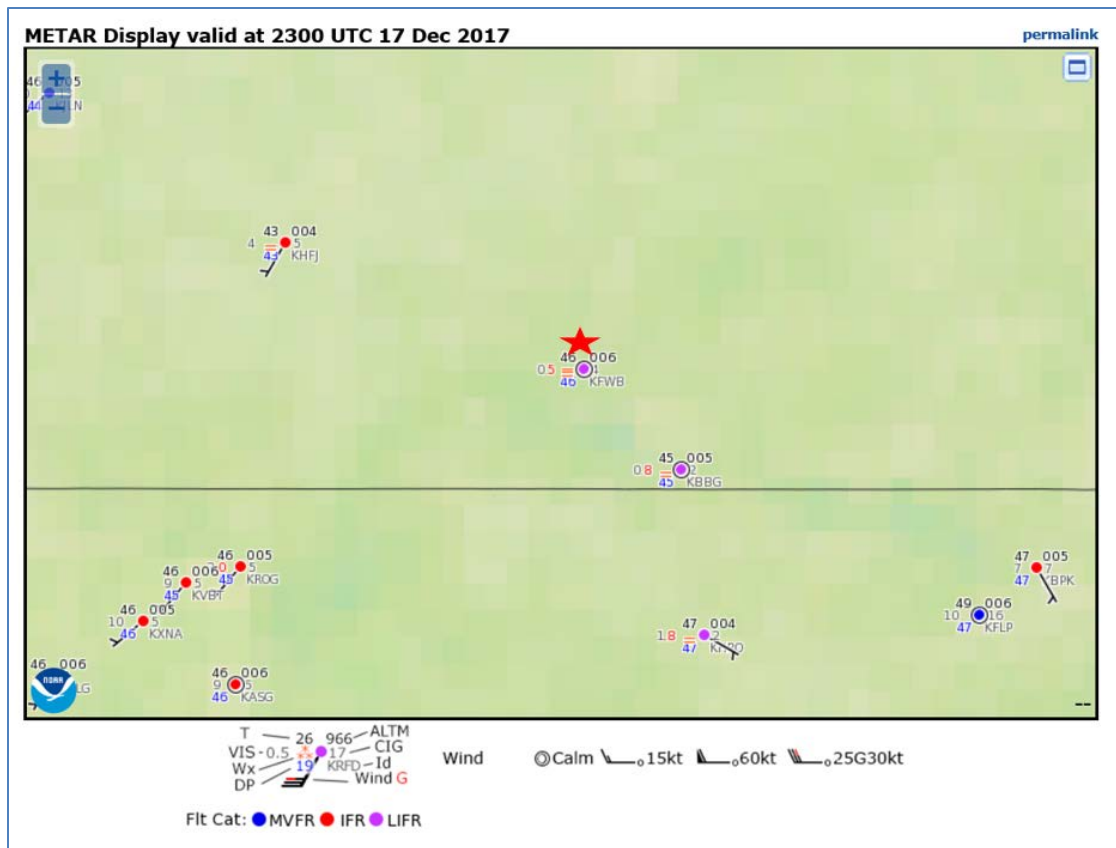
LIFR METAR KBBG 180045Z 00000KT 1 3/4SM BR OVC002 07/07 A3008=

LIFR METAR KBBG 180145Z 00000KT 1/2SM FG OVC002 07/07 A3009=

LIFR METAR KBBG 180235Z AUTO 00000KT 3/4SM BR OVC002 07/07 A3008 RMK AO2=

2.4 METAR Display

A display of the METAR observations from the NWS Aviation Weather Center (AWC) was captured after the accident for 1700 and 1800 CST are included as figures 5 and 6 respectively, with the accident site marked by the red star. The station models for KFWB and KBBG depicted LIFR conditions due to restricted visibilities in fog with overcast ceilings from 100 to 300 ft. At 1800 CST the closest MVFR conditions were reported at Monett Regional Airport (KHFJ), Monett, Missouri located approximately 32 miles west-northwest of the accident site and at Marion County Regional Airport (KFLP), Flippin, Arkansas, 47 miles southeast.



A High Resolution Rapid Refresh (HRRR)² numerical model data was obtained from the NOAA Air Resource Laboratory for 1800 CST over the accident site coordinates. The data was plotted on a standard skew T log P diagram³ using RAOB software⁴ from the surface to 500-hPa or approximately 18,000 ft, and is included as figure 7.

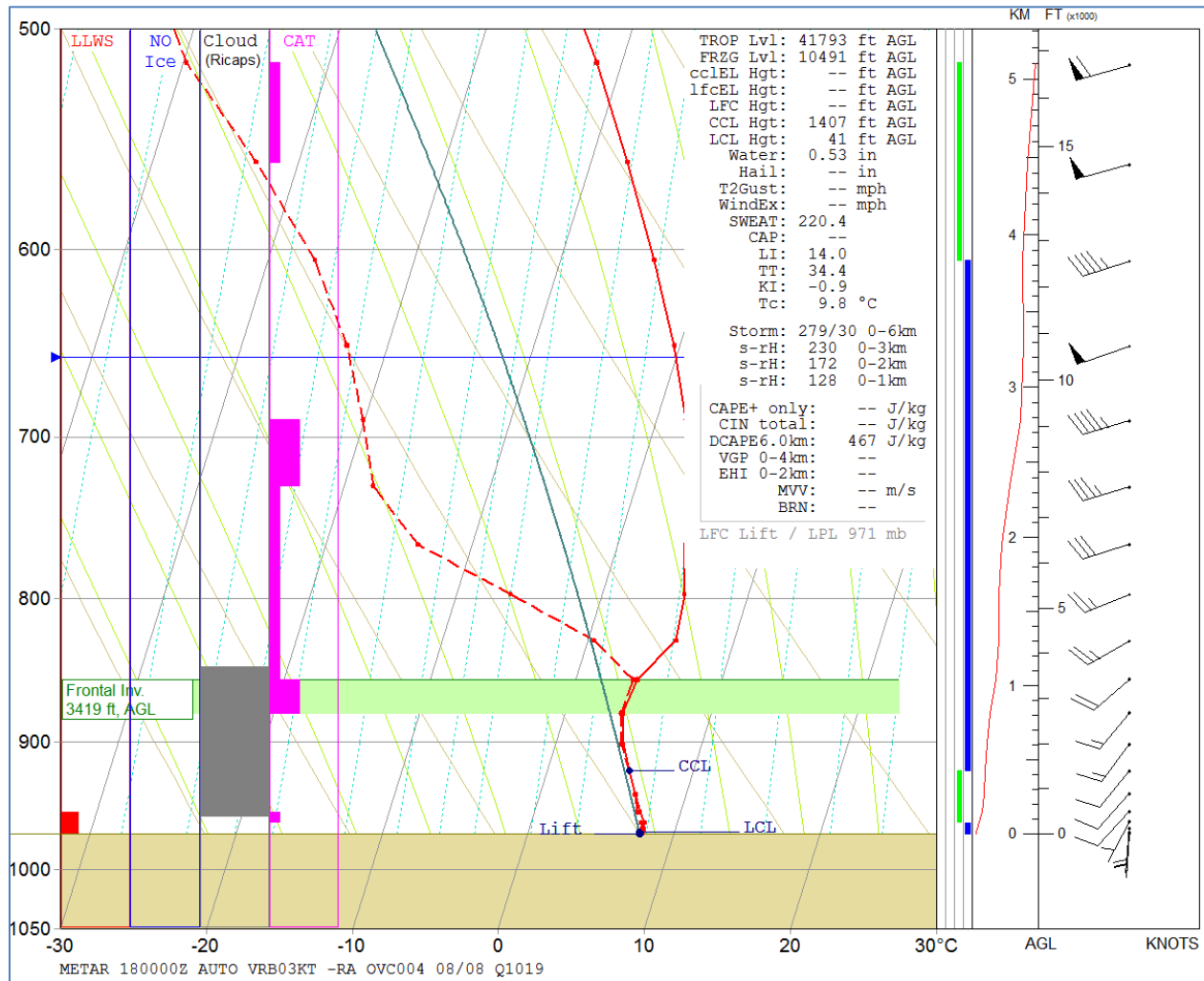


Figure 7 - HRRR numerical model sounding over the accident site at 1800 CST

The HRRR model sounding indicated an elevation of 1,329 ft, and indicated a temperature of 7.7° C (45.9° F), a dew point temperature of 7.6° C (45.7° F), a sea level pressure of 1018.5-hPa,

² HRRR – High-Resolution Rapid Refresh (HRRR) is a NOAA real-time 3-kilometer (km) resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by 3-km grids with 3-km radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a 1-hour period.

³ Skew T log P diagram – is a standard meteorological plot or thermodynamic diagram using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

⁴ RAOB software – The complete Rawinsonde Observation program is an interactive sounding analysis program developed by Environmental Research Services, Matamoras, Pennsylvania, for plotting and analyzing upper air data.

a relative humidity of 99%, and a density altitude of 716 ft. The lifted condensation level (LCL)⁵ was at 41 ft agl, with the convective condensation level (CCL)⁶ at 1,407 ft agl, with the sounding saturated or a relative humidity greater than 90% from the surface to about 3,500 ft agl where a frontal inversion was located, with drier air above. The sounding was characterized as stable with a Lifted Index (LI) of +14 and support stratiform type clouds with bases near 400 ft agl. The freezing level was identified at 11,800 ft, and no structural icing hazards existed for the flight.

The HRRR sounding wind profile indicated surface wind from 180° at 3 knots with wind veering clockwise to the west with height with a gradual increase in wind speeds above the frontal inversion. The mean 0 to 6-kilometer or 18,000 ft wind was from 250° at 40 knots, and the level of maximum wind was identified at 37,000 ft from 235° at 127 knots and was located below the tropopause at 43,100 ft.

A table of the HRRR model data of height, pressure (Pres), temperature (T), dew point temperature (Td), relative humidity in percent (RH), wind direction and speed (DD/KT), and derived clear air turbulence (CAT), low-level wind shear (LLWS), and icing potential from the surface through 10,000 ft is included in figure 8.

Height (ft-MSL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD / FF (deg / kts)	CAT (FAA)	LLWS	Icing - Type (AFGWC method)
1325	971	7.7	7.6	99	184 / 3			
1353	970	7.8	7.6	99	184 / 3		LIGHT	
1437	967	7.8	7.7	99	185 / 4		LIGHT	
1578	962	7.7	7.5	99	206 / 6	LGT	LIGHT	
1804	954	7.2	7.0	99	220 / 9			
2203	940	6.5	6.5	100	220 / 11			
2724	922	5.6	5.6	100	217 / 12			
3313	902	4.6	4.5	99	215 / 14			
4004	879	3.9	3.8	99	217 / 16	MDT		
4744	855	4.2	3.9	98	227 / 22	LGT		
5605	828	6.0	0.4	67	238 / 25	LGT		
6630	797	5.6	-6.3	42	247 / 25	LGT		
7727	765	4.6	-13.7	25	251 / 28	LGT		
9012	729	3.6	-18.0	19	253 / 35	MDT		
10471	690	2.0	-20.1	18	252 / 45			

Figure 8 - HRRR sounding parameters

Except for shallow layer near the top of the frontal inversion at 4,000 ft, where the RAOB software indicated an 83% probability of moderate turbulence no strong vertical wind shears were noted at low-levels for the generation of any strong turbulence. Only light LLWS was noted below 250 ft agl (1,578 ft msl). No structural icing was indicated below 10,000 ft.

⁵ Lifting Condensation Level (LCL) - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

⁶ Convective Condensation Level (CCL) - The height to which a parcel of air, if heated sufficiently from below, will rise adiabatically until condensation starts. This is typically used to identify the base of cumuliform clouds, which are normally produced from surface heating and thermal convection.

4.0 Satellite Imagery

The Geostationary Operational Environmental Satellite number 16 (GOES-16) data was obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System (McIDAS) software. The infrared long wave (band 13) imagery at a wavelength of 10.3 microns (μm) provided a resolution of 2-km surrounding the time of the accident were reviewed and image closest to the time of the accident documented. Due to the low angle of the Sun the GOES-16 high resolution visible imagery was not usable at the time of the accident.

Figure 9 is the GOES-16 band 13 infrared image at 1832 CST with a standard MB temperature enhancement curve applied at 2X magnification. The image depicts an extensive layer of low stratiform type clouds over southern Missouri and obscuring the accident site. The radiative cloud top temperature was 275 Kelvin or 1.8 C, which corresponded to tops near 10,500 ft.

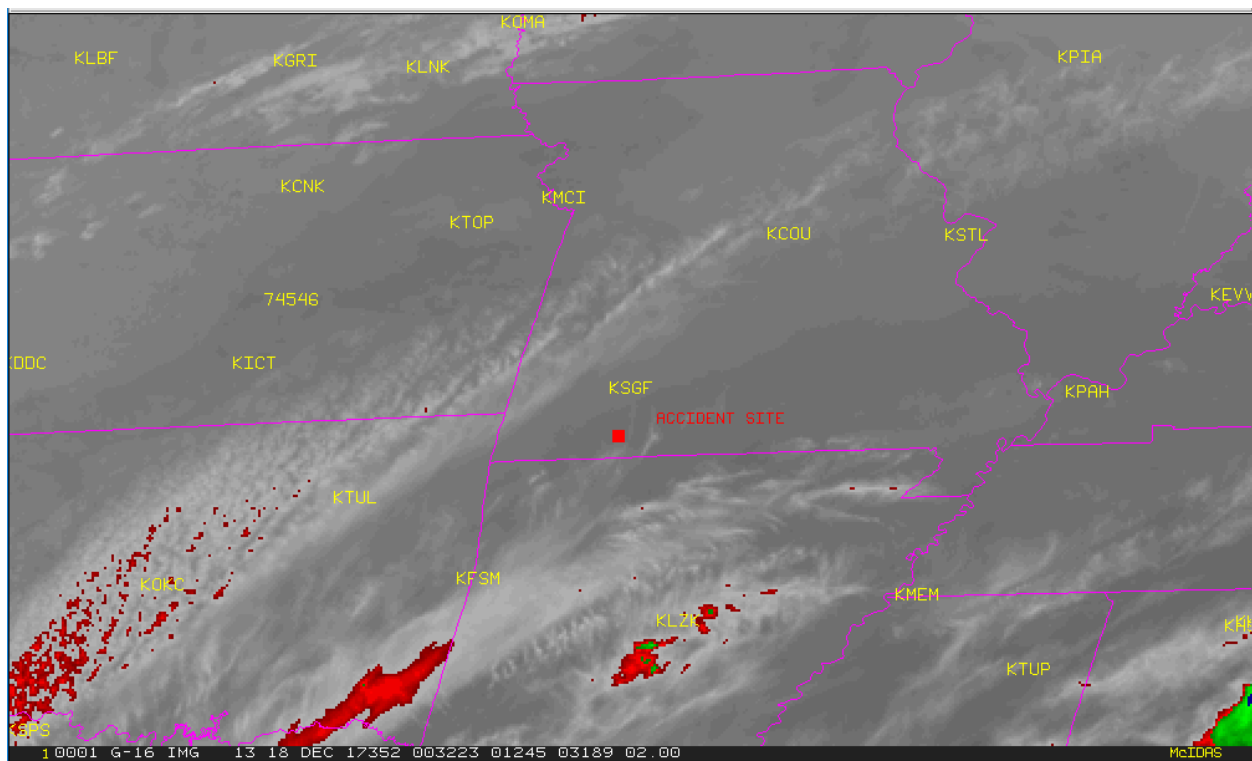


Figure 9 - GOES-16 infrared image at 1832 CST at 2X magnification

A GOES-16 visible band 2 image at 1607 CST at -2X magnification matching the image above showing the extent of the low stratiform cloud cover is included as figure 10, depicting the conditions viewable at the time of prior to departure. Another visible image at 1537 CST at 2X magnification depicting the low cloud cover prior to the flight's departure is included as figure 11. No visible image was available at the time of departure or the accident time due to the low light conditions and nighttime conditions.

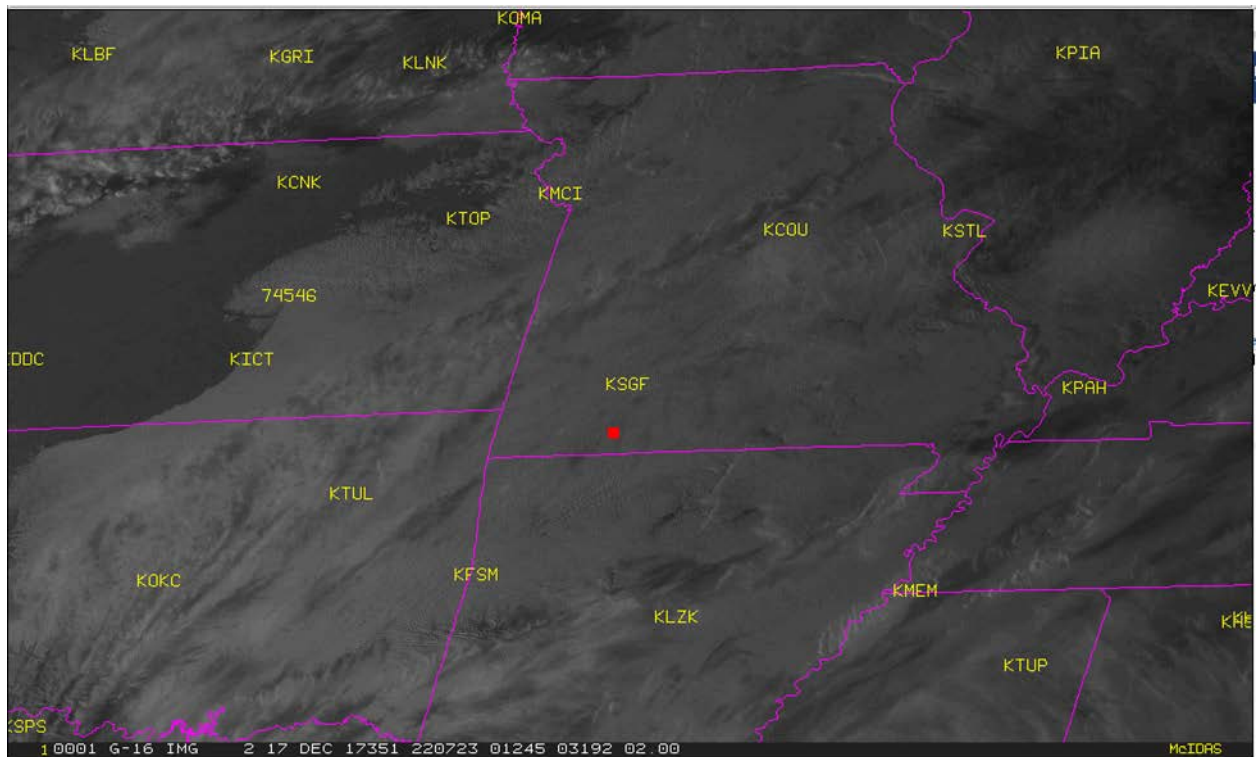


Figure 10 - GOES-16 visible image at 1607 CST

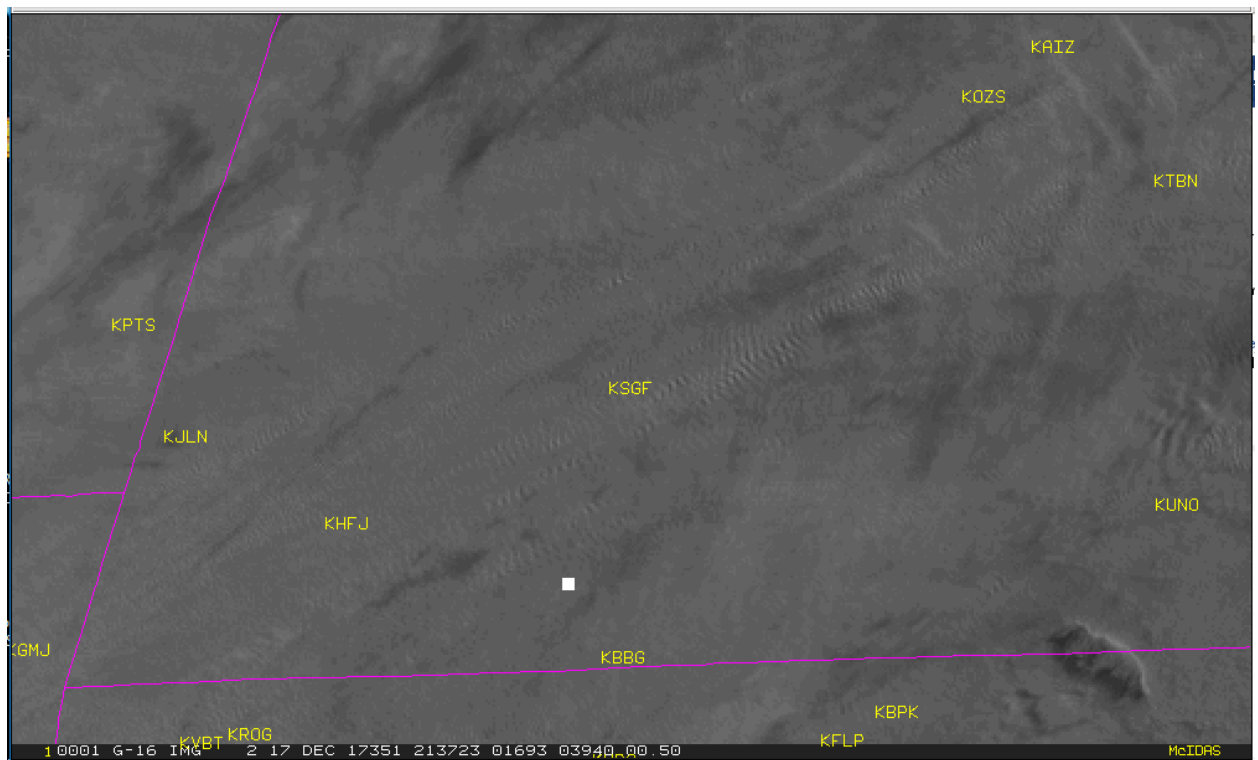


Figure 11 - GOES-16 visible image at 1537 CST at 2X magnification

5.0 Pilot Reports

The search for pilot reports or PIREPs over southern Missouri surrounding the period from 1200 through 2000 CST below 18,000 ft revealed no reports during the period. However; there were two reports in the Kansas City area near the departure airport during the period. The reports were transcribed from standard code and abbreviations, with time converted from UTC to local. The reports were as follows:

Kansas City International Airport (MCI) routine pilot report (UA); Over – 10 miles south of MCI; Time – 1307 CST; Altitude – 6,000 ft; Type aircraft – Bombardier Regional Jet CRJ-900 air carrier jet; Sky cover – overcast bases at 1,500 ft tops at 5,000 ft.

Kansas City International Airport (MCI) routine pilot report (UA); Over – 10 miles north of MCI; Time – 1827 CST; Altitude – 2,700 ft; Type aircraft – Boeing 737 air carrier jet; Sky cover – broken clouds with bases at 3,700 ft.

6.0 Terminal Aerodrome Forecast

The NWS Springfield, Missouri (KSGF) Weather Forecast Office (WFO) was responsible for the Branson area, but does not issue a Terminal Aerodrome Forecast (TAF) for the planned destination airport KPLK. The closest TAF to the accident site was issued for KBBG. While TAFs are only valid for a 5-mile radius from the airport center point; however, weather briefing sources will often provide the closest station's TAF for a more complete and detail timing of wind, ceiling and visibility. The TAFs issued for KBBG from the time of any preflight planning through the time of the accident were as follows:

*TAF KBBG 171732Z 1718/1818 VRB05KT 2SM BR OVC004
FM172000 VRB05KT 3SM BR OVC004
FM181400 23004KT P6SM BKN010
FM181700 24005KT P6SM SCT050=*

*TAF COR KBBG 171755Z 1718/1818 VRB05KT 1SM BR OVC004
FM172000 VRB05KT 3SM BR OVC004
FM181400 23004KT P6SM BKN010
FM181700 24005KT P6SM SCT050=*

*TAF AMD KBBG 171957Z 1720/1818 VRB05KT 1/2SM FG OVC002
FM172100 VRB05KT 1SM BR OVC004
FM181400 23004KT P6SM BKN010
FM181700 24005KT P6SM SCT050=*

*TAF AMD KBBG 172225Z 1722/1818 VRB03KT 3/4SM BR OVC003
FM181400 23004KT P6SM BKN010
FM181700 24005KT P6SM SCT050=*

*TAF KBBG 172320Z 1800/1824 VRB03KT 3/4SM BR OVC003
FM181300 23004KT 3SM BR OVC007
FM181500 24004KT 5SM BR BKN010
FM181700 24005KT P6SM SCT040=*

The initial forecast and the corrected TAF available to the pilot prior to his departure at 1700 CST expected LIFR conditions to prevail with variable winds at 5 knots, visibility 3 miles in mist with ceiling overcast at 400 ft agl. The 2 subsequent amendments and the next scheduled TAF continued with LIFR conditions with visibility being lowered to 3/4 mile and ceiling overcast at 300 ft agl.

7.0 Graphic Aviation Forecast

The NWS AWC website provides a Graphic Aviation Forecast (GFA)⁷ for a general forecast for enroute conditions and for airports without a TAF, and provides expected cloud cover and tops, wind, and weather. The GFA available for preflight planning was issued about 1300 CST on December 17, 2017 and valid for 1800 CST are provided in figures 12 and 13.

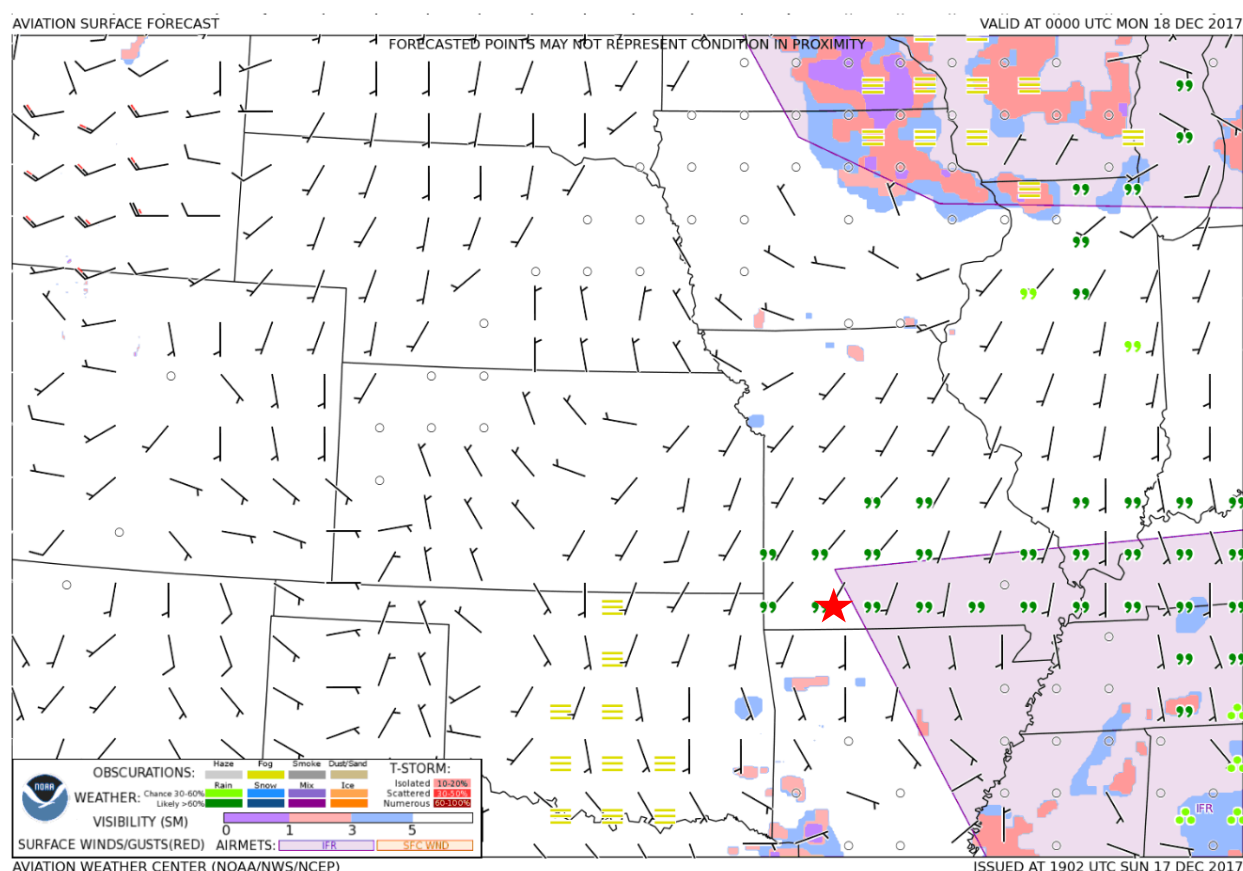


Figure 12 - Graphic Aviation Forecast surface forecast issued at 1300 CST and valid for 1800 CST

The GFA valid for 1800 CST for the general area of Branson expected light southerly wind at 3 knots, visibility 5 miles, and drizzle. An AIRMET for IFR conditions extended immediately to the east over southern Missouri, northeast Arkansas, Mississippi, Alabama, Tennessee, and Kentucky, but did not extend over the route or the destination airport.

⁷ NWS Aviation Weather Center – Graphic Area Forecast website (<http://aviationweather.gov/gfa>)

The second GFA chart (figure 13) for cloud cover expected an extensive area of overcast clouds over Missouri and indicated overcast cloud bases at 2,500 ft with tops at 3,500 ft.

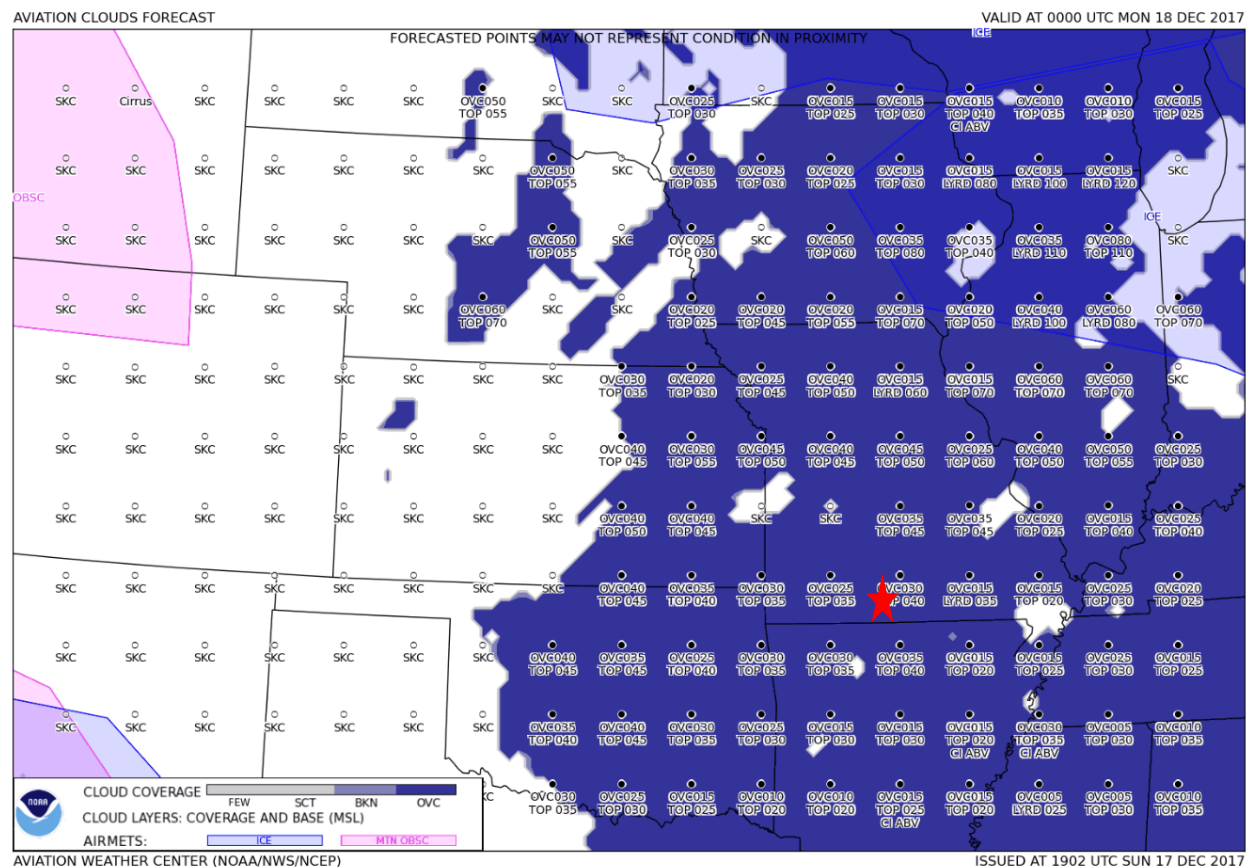


Figure 13 - Graphic Aviation Forecast cloud layers bases and tops valid for 1800 CST

8.0 Winds and Temperature Aloft Forecast

The Winds and Temperatures Aloft Forecast current for the route of flight was valid for 1800 CST, and for use between 1400 through 2100 CST and was as follows:

WINDS ALOFT FORECASTS

DATA BASED ON 171800Z

VALID 180000Z FOR USE 2000-0300Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
MKC	2509	3019+01	2725-01	2636-03	2552-17	2479-28	750243	752649	741758
SGF	2416	2525+05	2530+02	2549-01	2564-13	2572-27	740340	741948	742858
FSM	2115	2423+08	2534+06	2540+00	2558-13	2464-27	239840	732048	732559

9.0 Inflight Weather Advisories

The NWS had no Significant Meteorological Advisories (SIGMET), or Convective SIGMETs were issued for Missouri on December 17, 2017, and no hazardous weather meeting the SIGMET issuance criteria were identified. The Kansas City (KZKC) Center Weather Service Unit (CWSU) also did not issue Center Weather Advisories (CWA) advisories during the period for Missouri applicable for the route of flight during the period. However; the Memphis (KZME) CWSU which boundary extended over extreme southern Missouri and the accident site did issue several advisories during the period on December 17, 2017 for LIFR conditions due to low ceilings and visibilities in mist and fog. The KZME CWA's issued from 1128 CST through the time of the accident are included below, with the advisory current at the time of the accident in bold type and plotted in figure 14.

CWA #103 issued at 1128 and valid until 1400 CST

*FAUS21 KZME 171728
ZME1 CWA 171726
ZME CWA 103 VALID UNTIL 172000
FROM 30E RZC-20W SQS
AREA LIFR...100 NM WIDE...CIGS AOB OVC005.
VIS AOB 1SM BR/FG. CONDS CONTG THRU THE PD.*

CWA #201 issued at 1356 and valid until 1600 CST

*FAUS22 KZME 171956
ZME2 CWA 172000
ZME CWA 201 VALID UNTIL 172200
FROM 30W RZC-50NW ARG
AREA LIFR CONDS. 40NM WIDE. CIGS AOB 005 AND/OR VIS NEAR 1SM BR/FG.
CONDS EXPD TO CONT BYD 22Z.*

CWA #105 issued at 1559 and valid until 1800 CST

*FAUS21 KZME 172159
ZME1 CWA 172200
ZME CWA 105 VALID UNTIL 180000
FROM 20E DYR-30S MSL-25ENE ELD-75NNE TXK-40SE MEM-20E DYR
AREA LIFR CONDS. CIGS AOB 005 AND/OR VIS NR 1SM BR/FG.
CONDS EXPD TO CONT BYD 00Z.*

CWA #106 issued at 1700 and valid until 1900 CST (figure 14)

*FAUS21 KZME 172300
ZME1 CWA 172300
ZME CWA 106 VALID UNTIL 180100
FROM 30S PXV-50N SJI-25SE MLU-50NE TXK-30S SGF-MEM-30S PXV
AREA LIFR CONDS. CIGS AOB 005 AND/OR VIS AOB 1SM BR/FG.
CONDS EXPD TO CONT BYD 01Z.*

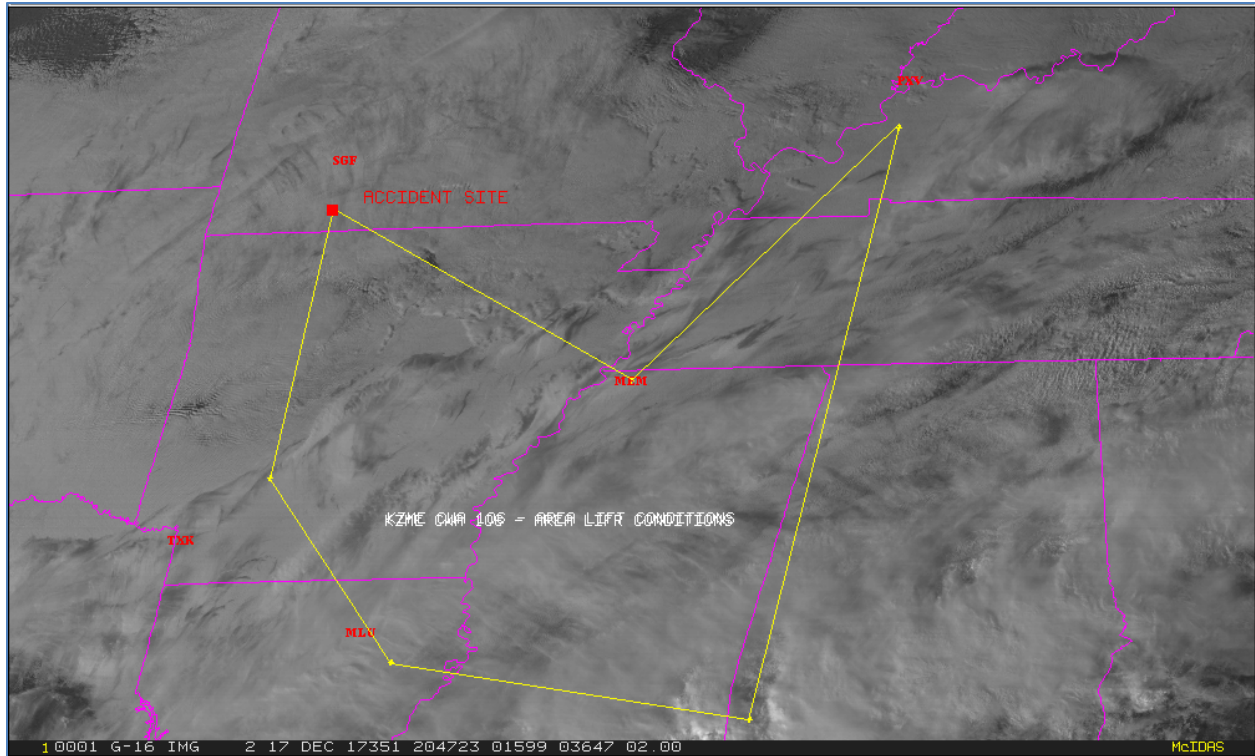


Figure 14 - Memphis CWSU CWA advisory #106 for LIFR conditions

In addition, the NWS AWC issued an Airmen's Meteorological Information (AIRMET) Sierra series of advisories at 1645 CST for an area of IFR conditions which extended over the route and the accident site and was valid until 2100 CST. The full text of the advisory is below followed by figure 15 which is the applicable advisory current over the accident site plotted over the GOES-16 visible image at 1447 CST.

WAUS43 KKKI 172045

WA3S

CHIS WA 172045

AIRMET SIERRA UPDT 6 FOR IFR AND MTN OBSCN VALID UNTIL 180300

.

AIRMET IFR...NE KS IA MO IL IN KY

FROM 20N OVR TO 40S DSM TO 40SSW STL TO 20N LOZ TO 30SSE LOZ TO RZC TO OSW TO 50NW OSW TO 20NW SGF TO MCI TO PWE TO 20N OVR CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.

AIRMET IFR...ND SD NE MN IA WI LM LS MI LH IL IN

FROM 30N INL TO YQT TO YVV TO DXO TO 40NNE FWA TO PMM TO IOW TO 40SSW FOD TO 50WNW FSD TO ABR TO 60SSW YWG TO 30N INL CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.

AIRMET MTN OBSCN...KY TN

FROM HNN TO HNV TO GQO TO 40SW LOZ TO HNN

MTNS OBSC BY CLDS/PCPN/BR. CONDS CONTG BYD 03Z THRU 09Z.

.

OTLK VALID 0300-0900Z

AREA 1...IFR KS MO IL IN KY OK TX AR TN LA MS AL AND CSTL WTRS

BOUNDED BY FWA-CVG-HNN-HMV-GQO-50SW PZD-40W CEW-60SE SJI-80SE

LEV-120SSW LCH-80E BRO-90W BRO-DLF-70SSE FST-30NW MAF-40N ABI-
40ENE CDS-OSW-30SW ICT-20WNW BUM-20WSW UIN-FWA
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG THRU 09Z.

AREA 2...IFR ND SD MN IA MO WI LM LS MI LH IL IN
BOUNDED BY 60SW YWG-30N INL-YQT-YVV-20ESE DXO-FWA-20WSW UIN-
50WSW FOD-40SSE ABR-60SW YWG
CIG BLW 010/VIS BLW 3SM PCPN/BR. CONDS CONTG THRU 09Z.

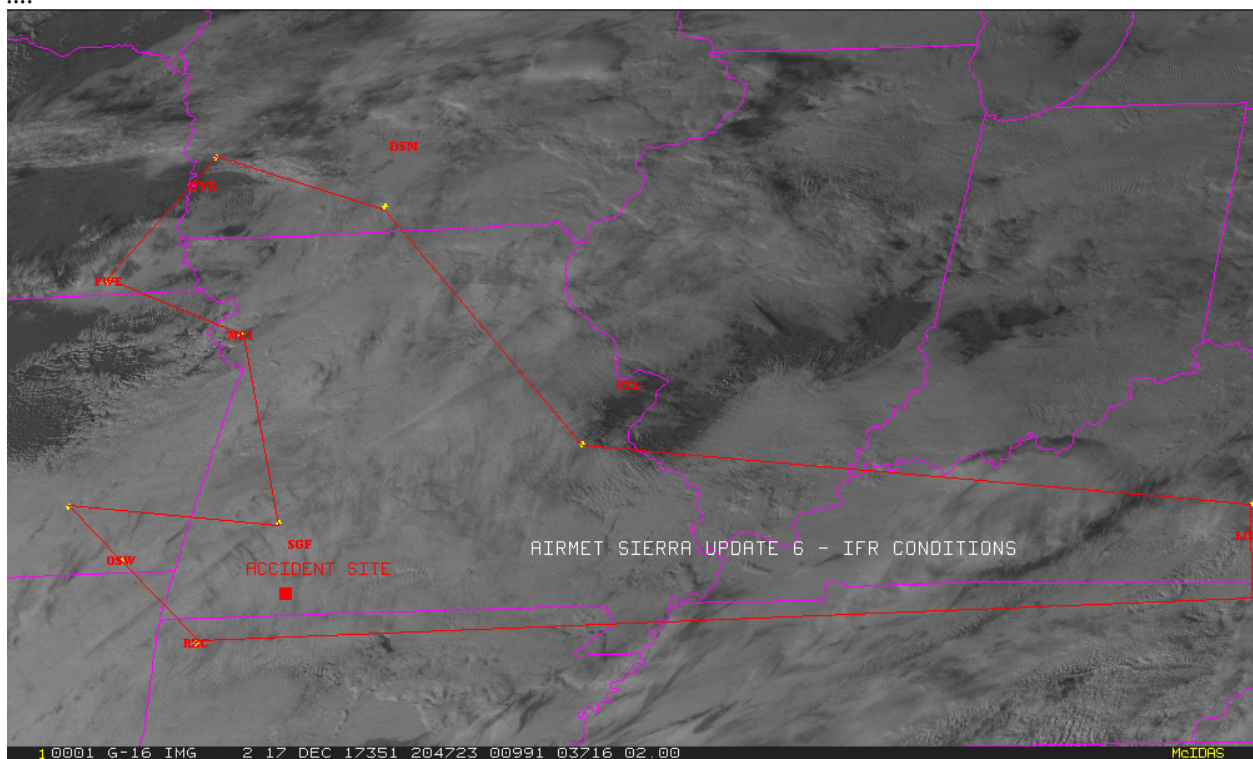


Figure 15 - AIRMET Sierra update 6 for IFR conditions

Figure 16 is the Graphic AIRMET Sierra series of advisories issued at the same time and depicted graphically on the AWC's website. The four-panel graphic below is the initial conditions and the 3-, 6-, and 9-hour forecast for IFR conditions and mountain obscuration conditions expected. The initial conditions for 1800 CST in the top left corner indicated that IFR conditions were expected along the route and over the accident site, the 3-hour forecast for 1800 CST on the top right improved the conditions over central Missouri, while still extending the conditions over extreme southern Missouri. The 6-hour panel on the bottom left continued with the general conditions from the 3-hour forecast with minor adjustments. The 9-hour panel on the bottom right began to expand the area of IFR conditions over southern Missouri.

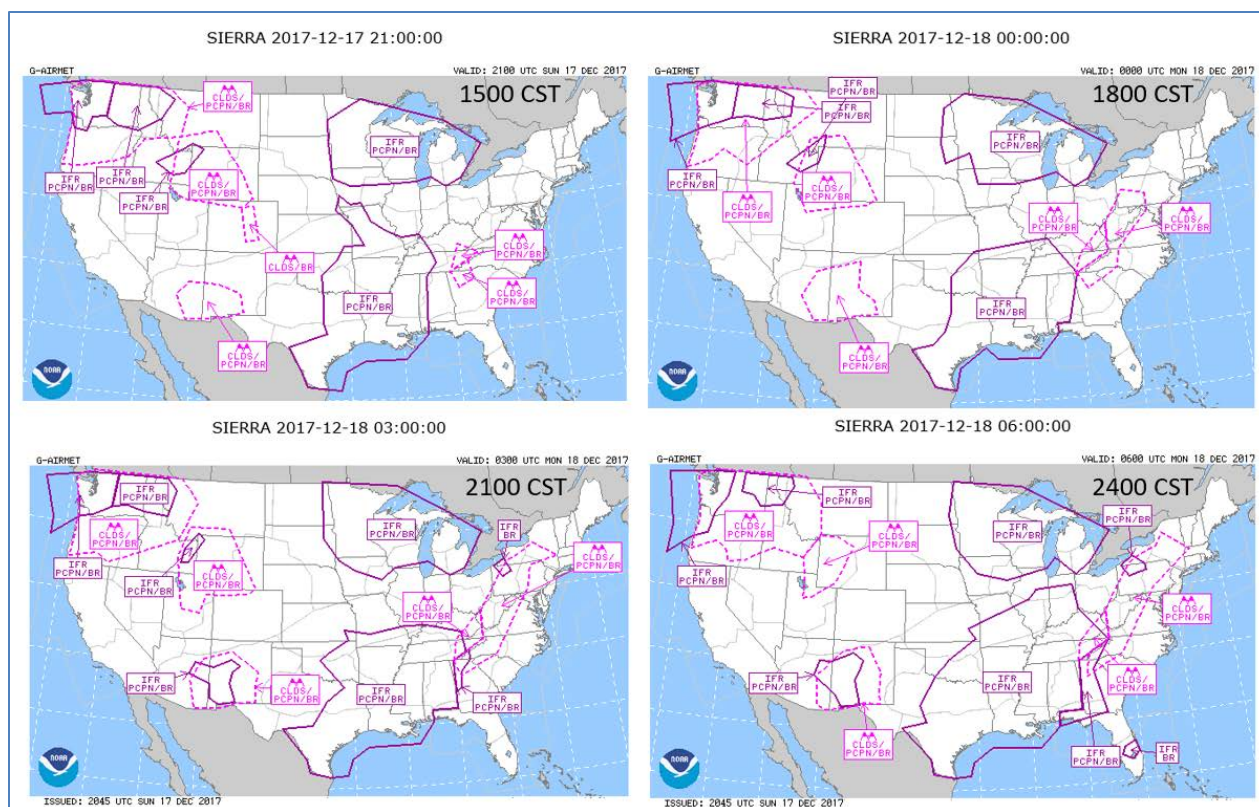


Figure 16 - G-AIRMET Sierra issued at 1445 CST

10.0 Weather Briefing

A search of the FAA contract Automated Flight Service Station (AFSS) provider Leidos and the Direct Users Access Terminal Service (DUATS) provider indicated no contact with the pilot of N6433J on the day of the accident, a search of Foreflight also revealed no contacts were made for any weather briefings. It is therefore unknown what the pilot of N6433J knew about the current or forecast weather conditions over the route.

11.0 Astronomical Conditions

The United States Naval Observatory's website provided the following astronomical conditions for Reeds Springs, Stone County, Missouri on December 17, 2017:

Moonrise	0635 CST
Begin civil twilight	0651 CST
Sunrise	0720 CST
Sun transit	1210 CST
Moonset	1655 CST
Sunset	1659 CST
End civil twilight	1728 CST
Accident	1830 CST

At the time of the accident both the Sun and the Moon were more than 15° below the horizon and provided no illumination at the time of the accident. The phase of the Moon was a waning crescent with 0% of the Moon's visible disk illuminated. Dark nighttime conditions existed at the time of the accident.

Submitted by:

Don Eick
Senior Meteorologist